COMMENTARY

FROZEN POSSIBILITIES

On the Apparent Incompatibility of Quantum Mechanics and Relativity

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Surreal spiral of warped clocks in space, visualizing relativity and quantum uncertaintyalten.
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By Michael Janke

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For decades, physicists have been trying to unify quantum mechanics and relativity theory – so far without success. Perhaps the problem does not lie in the formulas themselves, but in our perspective.

TWO WORLDS, TWO LANGUAGES

The general theory of relativity portrays the world as a smooth, continuous fabric of spacetime in which gravity is caused by the curvature of geometry. Quantum mechanics, on the other hand, operates in a reality of probabilities, superpositions, and discrete jumps. They are two theories that are experimentally unshakable in their respective domains – and yet incompatible as soon as one attempts to bring them together.

BECOMING AND BEING

Perhaps this incompatibility is less an indication of the incompleteness of physics than of a misunderstanding. For quantum mechanics and relativity theory do not address the same status of reality. Quantum mechanics describes the becoming – the open, probabilistic initial state. Relativity theory, by contrast, captures the being – the solidified form that emerges from this sea of possibilities.

GRAVITY AS A TRACE

In this picture, gravity would not be a fundamental force but the signature of the solidified, the imprint left by the transition from possibility to reality. Space and time appear like an ice floe on a restless quantum sea: stable enough to carry our lives, yet only a fragment of an infinite variety of potential crystallization patterns. Gravity thus does not appear as a cause, but as the trace of the process through which the open becomes fixed form.

MISCONCEPTION "PARALLEL UNIVERSES"

Even the popular notion of "parallel universes" can also be understood in a more nuanced way. It is conceivable that, alongside our world, other solidifications of the quantum realm exist – fully-fledged universes with their own space-time. Equally conceivable are unfinished universes, mere embryonic solidifications that never developed into a stable reality. Yet whether complete or only inchoate, they remain inaccessible to us, as no connection to our world exists and life in our sense would hardly be possible there.

A NEW PERSPECTIVE

The price of this view is high: gravity loses its status as a fundamental interaction. Yet the gain is a surprisingly simple interpretation of the unresolved contradiction: quantum mechanics and relativity theory are not competitors, but temporally staggered stages of the same reality – process and result, beginning and end. Perhaps the solution lies not in the forced unification of two irreconcilable theories, but in the recognition of their relation to one another.

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